CS415 Homework Assignment 4 : Virtual Memory and Scheduling

1 Problems

1.1 Problem 1

(20 pts) A process references five pages A, B, C, and D in the following order: A;B;D;A;B:C;D;E.

The Virtual Memory Manager (VMM) is using the first-in, first out replacement strategy. How many frames will be swapped to/from memory is the process is allocated three physical memory frames? Repeat for four frames.

1.2 Problem 2

(20 pts) A process contains eight virtual pages on disk and is assigned a fixed allocation of four physical frames in main memory.

The program accesses memory pages in the following order:
1,0,2,2,1,7,0,1,2,0,3,0,4,5,1,5,2,4,5,6,7,6,2,4,2,7,3,3,2,3

1. Show what virtual frames are stored in the physical frames as the process accesses memory if the VMM uses a FIFO replacement strategy. Assume the physical frames are empty when the process starts. Compute the hit ratio in main memory.
2. Now do the same thing for when the VMM uses LRU replacement. Compute the hit ratio.
3. Given the respective hit ratios, would FIFO replacement approximate LRU replacement for this memory trace? Why or why not?

1.3 Problem 3

(20 pts) Suppose a page replacement string for a process has a working set of M frames, initially all empty. The page reference string is of length P with N distinct page numbers in it.

1. What is a lower bound on the number of page faults (justify your answer)?
2. What is an upper bound on the number of page faults (again, justify your answer)?

1.4 Problem 4

(20 pts, 5 pt. per algorithm) Consider the following workload:

Thread	Burst Time	Priority	Arrival Time
T1	50ms	2	0ms
T2	20ms	1	20ms
T3	100ms	4	40ms
T4	40ms	2	60ms

Show how the threads would be scheduled using FCFS, SRT, non-preemptive priority and round robin with a 30ms quantum.

1.5 Problem 5

(20 pts) The Rather Annoying Intern comes to you with a suggestion for a new scheduling policy for scheduling processes that is a RR scheme where the contents of the ready queue are pointers to PCB of a process.

1. What would be the effect of pointing two pointers to the same process in the ready queue?
2. Does the Rather Annoying Intern have a good idea or a bad idea (in other words, what are the advantages or disadvantages of this scheme)?
3. Explain to the Really Annoying Intern how you can change the standard RR algorithm to achieve the same effect.

2 Submission instructions

You will need to document your submission in a short report that includes responses to questions and any supporting source code. Please attach this report, in PDF format, to your submission in Blackboard.